

INDIAN SCHOOL DARSAIT

Class XII

Mathematics Worksheet

Worksheet # 9 Differentiability # 3

(Chapter – 5: Continuity & Differentiability)

CLASS WORK

1.	If $y = Ae^{3x} + Be^{2x}$, prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$
2.	If $y = [x + \sqrt{x^2 + 1}]^m$, prove that $(1 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - m^2y = 0$
3.	If $y = A\cos(\log x) + B\sin(\log x)$, prove that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$
4.	If $y = e^{ax} \sin bx$, prove that $y_2 - 2ay_1 + (a^2 + b^2)y = 0$
5.	If $y = (\tan^{-1} x)^2$, prove that $(x^2 + 1)^2\frac{d^2y}{dx^2} + 2x(x^2 + 1)\frac{dy}{dx} = 2$
6.	If $y = (\sin^{-1} x)^2$, prove that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 2 = 0$
7.	If $y = e^{a\cos^{-1}x}$, prove that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0$
8.	If $y = \frac{\sin^{-1} x}{\sqrt{1 - x^2}}$, prove that $(1 - x^2)\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} - y = 0$
9.	If $(x - a)^2 + (y - b)^2 = c^2$, prove that $\frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}}{\frac{d^2y}{dx^2}}$ is a constant which is independent of a and b.
10.	If $x = \tan\left(\frac{1}{a} \log y\right)$, show that $(x^2 + 1)\frac{d^2y}{dx^2} + (2x - a)\frac{dy}{dx} = 0$ OR Show that $(x^2 + 1)^2\frac{d^2y}{dx^2} + 2x(x^2 + 1)\frac{dy}{dx} - a^2y = 0$
11.	If $y = \sin(\sin x)$, show that $\frac{d^2y}{dx^2} + \tan x\frac{dy}{dx} + y\cos^2 x = 0$
12.	If $y = x^x$, then prove that $\frac{d^2y}{dx^2} - \frac{1}{y}\left(\frac{dy}{dx}\right)^2 - \frac{y}{x} = 0$
13.	If $x = \sin\left(\frac{1}{a} \log y\right)$, prove that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0$
14.	If $y = A[x + \sqrt{x^2 + 1}]^n + B[x - \sqrt{x^2 + 1}]^n$, then show that $(x^2 + 1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - n^2y = 0$

HOME WORK

15.	If $y = Ae^{3x} + Be^{2x}$, prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$
16.	If $y = \log[x + \sqrt{x^2 - 1}]$, prove that $(1 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0$

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17.	If $y = A \cos(\log x)$, prove that $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0$
18.	If $y = (\sin^{-1} x)$, prove that $(1-x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 2 = 0$
19.	If $y = \operatorname{Cosec}^{-1} x$, prove that $x(x^2-1) \frac{d^2 y}{dx^2} + (2x^2-1) \frac{dy}{dx} = 0$
20.	If $y = x^3 \log\left(\frac{1}{x}\right)$, prove that $x \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 3x^2 = 0$
21.	If $y = e^x (\sin x + \cos x)$, prove that $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 2y = 0$
22.	If $y = \sqrt{x+1} - \sqrt{x-1}$, prove that $\frac{d^2 y}{dx^2} + x \frac{dy}{dx} - \frac{1}{4} y = 0$
23.	If $y = (a+bx).e^{cx}$, prove that $y_2 - 2cy_1 + c^2 y = 0$
24.	If $\cos^{-1}\left(\frac{y}{b}\right) = \log\left(\frac{x}{n}\right)^n$, then prove that $x^2 y_2 + xy_1 + n^2 y = 0$
25.	If $y = (\cot^{-1} x)^2$, prove that $(x^2+1)^2 \frac{d^2 y}{dx^2} + 2x(x^2+1) \frac{dy}{dx} = 2$
SELF STUDY	
26.	If $e^y(x+1) = 1$, prove that $\frac{d^2 y}{dx^2} = \left(\frac{dy}{dx}\right)^2$
27.	If $y = \tan^{-1} x$, find $\frac{d^2 y}{dx^2}$ in terms of y .
28.	If $y = \operatorname{Cosec} x + \cot x$, show that $\sin x \frac{d^2 y}{dx^2} = y^2$
29.	If $(ax+b)e^{y/x} = x$, then show that $x^3 \frac{d^2 y}{dx^2} = \left(x \frac{dy}{dx} - y\right)^2$
30.	If $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, prove that $\frac{d^2 y}{dx^2} = -\frac{b^4}{a^2 y^3}$
31.	If $y = x \cos x$, prove that $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + (2+x^2)y = 0$